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ABSTRACT

This paper poses several questions as an introduction to examining educational technology and development. These include: "How Hard Is the Science?"; "How Human Are the Arts?"; "How Literate Are Martians?"; "From Data to Wisdom, Will the Real Hologram Stand Up?"; "From Wisdom to Creativity, Can I Have Another Piece of Teacher?"; "Panic Design and Positive Breakdown"; and "Open That Can of Software, Waiter." It then goes on to discuss the concept of user-involved design, a set of cooperative and participation techniques for coping with current field problems in education, from the organizational, technological, and socio-cultural point of view. The paper concludes by describing three projects being carried out in Flanders: (1) the development of a CD-ROM about multicultural childcare; (2) participation in the development of a virtual center on the World Wide Web for a European project called T3 (Telematics for Teacher Training); and (3) the creation of a Web-based course on cultural literacy at the University of Ghent. (Contains 15 references.) (AEF)

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Breakdown Into the Virtual: User-Involved Design, and Learning

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Breakdown into the Virtual: User-involved Design, and Learning

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Science has been changing rapidly over the last decade. Like everything else around us it seems to be in a turmoil of altering, mutating, or disappearing. Most likely the idea of *change* is a cultural phenomenon, and could be seen as a side effect of the 'strange attraction' the media have invoked upon us. Chaos and all of the modern self organizing hocus pocus are splattered all over popular interpretations of phenomena too complex to talk about.

How Hard is the Science?

One of the distinguishing factors in all this may be the evolution of computer science, realizing its potentiality of calculation, representation, and symbolization. This goes beyond the mere superficial digitalization of all scientific data, of the analyses programs, and the evaluation and the dissemination of results. Suddenly a bunch of people grew weary with the way things were going, they strapped together a couple of simple hypotheses and started to advocate controversial views to quintessential theories. Some 20 years ago, it was obvious that interdisciplinarity as a mission had failed, but at the very same time it became apparent that the traditional pillars of academic wisdom were cracked and that previously well defined disciplinary domains were merging, to the horror of many. Only one element was hampering the demolition of the dusty temple: the lack of a common methodology, a collective vocabulary, a general theory that could function as a fertile ground for the postulation of even wilder things to come. And suddenly the words were all over the place: chaos & order, complexity, artificial life, cellular automata, self-organization, virtuality, smart materials, fuzzy logic, dynamical patterns, adaptive systems, ... The palace revolution had started and the punks took over the security guards. Some older guys who previously had been pushed into the peripheries, headed the gang. Paul Davies, Richard Dawkins, Daniel Dennett, Brian Goodwin, Stephen Jay Gould, Daniel Hillis, Douglas Hofstadter, Stuart Kauffman, Christopher Langton, Marvin Minsky, Dan Norman, Roger Penrose, ... are now considered the intellectual barometers of this time, and get the status of pop stars with equal broadcasting time.

From the beginning on, that new frame of analysis and research was not restricted to the hard sciences like genetics, physics, biology, or to deviant groups within artificial intelligence and logics. No, there was a strong belief that whatever was to be discovered or disputed could be of interest to any denomination within the social and human sciences, and arts as well. In an introduction to Ilya Prigogine's 'Order out of Chaos' Alvin Toffler suggested this as early as 1984.

Ever since, most areas have been tuning in: recent publications from sociology, philosophy, anthropology, and also communication theory use perspectives drawn from this 'scientific revolution'. Though the unresolved question remains: how can we look and at what exactly, and how can we represent all this? But there is a new authoritative certainty - whether right or wrong is not at stake here - that former views just yield a less complete picture of the world. Furthermore, the idea is out that we have to live with a lot of contradictive, heterogeneous theories applied with less certainty than what we have put to use in the past.

How Human are the Arts?

Now, turning to the human sciences - the field where for centuries content, cultural and social values, aesthetics and the interplay between them have been debated - we find a strong sense of isolation and stagnation. Not only has critique been paralyzed by an overrated historical consciousness, blind for the schism caused by the new scientific revolution's paradigms, there is also a strong luddite affiliation. This purely emotional aversion from automation of activities, as if it would obstruct the free thinking wet being called man, even founded a new subsection, knit together by anti-technological quotes from this and that renowned philosopher: technology assessment! Over the last 20 years the arts seem to have forgotten it has always been also a field for experimentation with media, content, and ideas. And finally, after missing the boat completely and over and over again, under strong instigation of the other sciences mentioned above, the arts are reformulating their position towards interdisciplinarity.

In this rescue operation, it obviously has lost its sovereignty within the academic world. This is not a trivial issue, at least not for the field of education. The cultural literacy debate may be considered one of the last outcries of a dying world. It is the desperate attempt of a couple of old white men to put traditional knowledge and methodological revisionism back in the saddle. The whole discussion was politically driven by conservative governments but backed up by either center and left. Of course it had nothing to do with politics, but with the way a changing world was imposing its demands on society itself.

How Literate are Martians?

Hirsch's statement conformed to the American tradition in which lists are the representation of the facts behind the curriculum: *Cultural Literacy. What Every American Needs To Know* (1991) claimed to be built on research and learning theories, and concluded with an extensive list of names, dates, items, words. It advocated a common knowledge as a solution for dropout and failure. Roger Schank, in his *Engines for Education* (1995), dismissed the position as inappropriate. He extensively showed Hirsch's fundamental misconceptions of current research, communication models, and learning theories. Back to the real world. About 20 years ago in school I had to learn by heart all the states of America and their capitals. Now there is a company who sends out a demo package for computers to do speech recognition. Your computer is a quiz-master and you have to reply the capital for the given state. To my embarrassment I did not know anymore what the capital of California was. So much for my 'schooled mind' of course. So much for the list-approach and common knowledge myth, I guess, because you cannot force a background and situation on someone, which leaves room for speculations about more essential questions. How do we organize a dynamic curriculum based on different and common styles of learning, dependent on the individuals involved, and how do we introduce temporal changes. Secondly how do we assess learning, and how do we feed the results - if any - back into the curriculum. Thirdly, how do we provide schools and individuals with the necessary equipment, tutors, and finances to safeguard a long-term organization of learning with different collaborative and individual units.

All these questions are addressed frequently nowadays, but somehow it seems that the cultural division between old and new still obstructs a common view, on how to act effectively in this society, knowing that there is only a soup out there, a loose collection of disparate knowledge. Reformulating this for instance from the point of view of art: How are you going to deal with culture and art in a world where literature, video, film & music, and other arts become indistinguishable from each other?

The traditional historical method is to a certain extent useless, since it leaves out the crossovers to save the disciplines. To my own astonishment, most people lack the necessary background in 20th century art to use it satisfactorily: when most of the constructivist academics have never heard of the Russian constructivist movement at the beginning of this century, when engineers robotics have never read (even about) Capek or Asimov, when multimedia designers has never seen any dadaist film experiment from the thirties ... My judgment is that they won't necessarily be bad theorists, scientists, teachers, artists. The only conclusion we can draw here is that the humanities have failed tremendously in conveying creative models for dealing with necessary activities nowadays: whether you talk about cognitive, cultural, or educational things.

Another answer was supposed to be found in the works of the current fashionable breed of French Postmodern philosophers like Jean Baudrillard, Gilles Deleuze, and Felix Guattari, Bruno Latour ... Nowadays fiction and technology seem to merge, in a sense that the everyday use of electronic money, digital sound and images, cybercommunications, etc. trashes most of the utopian science fiction predictions from let's say a decade ago. Philosophy, like we already mentioned above, hasn't been too inventive lately. Apart from the inefficiency of technology assessment to act as an 'ethical' filter and controller in the proliferation of the digital era, the critical distancing techniques formerly used to comment and reflect on socio-cultural change proved to be totally inadequate dealing with media technology. Baudrillard, Deleuze and Guattari and others can try to formulate insights and theoretical foundations, due to the quantification and commodification of the media. They try but they are not heard at all, and therefore are irrelevant in the media debate. One of the reasons for this could be that the languages within the media - natural and artificial - conflict radically. To give one trivial example *one size of course doesn't fit all*. In the philosophical essay "rhizome" our famous and over-quoted friends bullshit away for as long as 65 pages to describe what is generally referred to as a network, and the metaphors it could allude to. In fact when they describe a rhizome it takes them approx. 15 pages of incomprehensible and abstract jabber to explain nothing else than what Ted Nelson and others were talking about, in much clearer and more influential language, some 20 years before.

Now Deleuze and Guattari do the story over with metaphors, mystifications, and doubtful analogies. But that is not the major problem. By doing so, they don't add anything to the picture we already have, constructed by our individual use of cultural and tecanological artifacts. So, this form of abstraction leads not to a better understanding of innovations in society, a cognitive change, or a cultural dynamic. On the contrary, it is in essence a centralist move

- rather in the spirit of the former literacy debate - to save the boundaries of the discipline by declaring it open and well-suited for creative use.

Not only is the language itself unsatisfactory (incomprehensible as we labeled it, but call me an idiot if you understand it and you explain it better to me), also the form in which the language occurs is totally ineffective to acknowledge the position it claims: debate is out there on the network itself and not in the printed medium. Furthermore, the definition of the networks and the cultural artifacts related to it are dynamically created on the network and by the users (including industry), but not in the mind of some chic philosophers, or in a series of publications after the fact.

And so the last text by Felix Guattari before he died, *Remaking social practices*, got merciless slashed to pieces on the nettime-list recently. So much for the inadequacy to mix, and trash, and clash. (I know, endurance exists only in the primed world.). Latour already warned against what he called the 'disillusioned rationalists'. Maybe the sterilizing effect this kind of discourse has on our culture in general, can also be comprehended looking at the art world. Characteristic is the choice of the curator of the last Documenta, Catherine David, to expose existing works: there is no new productive message to be launched, no creative task to set out but expose what already has been done. There wasn't any Documenta before so drenched in discourse: more lectures than artworks were presented to the audience. The catalogs mentioned good old Roland Barthes, Jacques Lacan, Louis Althusser, Michel Foucault and Jürgen Habermas as if they were still alive.

And I guess we expect more in these neo-postmodern years. There is more happening than just global economy and a monolith capitalist system. The commodification of research and development throughout the dependency on machines and software (from text processors through organizers and mail programs) is also chaperoned by a whole set of new conducts and practices. So it is not enough to say: "look people, the picture is fuzzy" or shout out "chaos-theory", whether we talk about media, culture or education. It is not enough to shout "simulation" to reality, and indulge into an ultimate reformulation, ironization and redoubling of theories and practices. And finally it is not enough to denounce 'Mickey Mouse' culture and hide into cultural and political protectionism.

We have to take seriously into account the present activity-shift, the job-hopping happening at the other end of the fashionable debates, in order to realize the potential behind the new tools we use, even if they will prove to be the emperor's clothes later on. There is an obvious split occurring, one that no-one wants to stop, because the promise at the other side of the hill is much more rewarding, maybe out of selfish curiosity or crazy trendyness, but much more because there is bread in it in the first place.

From Data to Wisdom, Will the Real Hologram Stand Up?

Now the discussion we have been conducting so far may seem far-fetched or only for a crowd of insiders. But it serves as an illustration of how our disciplines fight to persist, despite a radically different and alternative construction that encircles them, threatening certain authorities, and constructing new ones. In a way it predicts the end of traditional epistemology and philosophical/critical discourse, and it embodies the slow germination of elements, which could - but not necessarily - breed a new genre of academic and socio-cultural practice, maybe an educational one.

We want to portray the difference between what we jokingly call (in true post-neo-startrek style, I know) "the battle analogs vs. digitals". It comments on the growing schism apparently occurring throughout the use of those specific media, called new media (to separate them from pre-80s technologies), and the reconstruction of a new kind of discourse springing from that digital fountainhead. Finally it illustrates the complexity of attitudes, or beliefs, towards information and knowledge.

At both ends of the continuum we can identify different sensibilities that position themselves paradoxically and antagonistically against each other. On one end there is a belief in abstraction as the representation of many phenomena occurring in reality. The belief is that generating new abstractions can lead to a better insight in reality. The other end does not recognize this as a plausible method, and only validates inferences derived from concrete data. This results in a new form of behaviorism, visible in the new developments in machine vision, software agents, ...

Another characteristic belief can be described with the terms involvement and participation. Whereas the traditional brand of academics still believes in 'distance' as a condition for formulating critique, others emerge who claim 'involvement' as essential. That this difference is not merely a generational or technological discrepancy is illustrated by Clifford Geertz's *After the Fact* in which he looks back on his career as an anthropologist, claiming that there is no general truth and a singular history, while reflecting on his personal fieldwork and relating it to some developments within human sciences.

This leads us to a third paradigmatic difference: 'situatedness'. It is the tip-top where anti-abstraction and involvement meet, and takes into account the environment in which the network is situated, with its almost tangible users/participants. It is the dynamic attitude of recognizing the incapability of escaping the social construction which constitutes the artifacts that surround us. A well-known example is Donald Norman's *The Psychology of Everyday Things*, one of the publications that contributed to the change of cognitivism as well as the start of a new direction in interface design.

There are many different views possible, and worth mentioning, only to get rid of the false dualist representation in the former paragraphs. Manuell Ca[illegible]'s talks about *transformists*, *continuists* and *structuralists*, indicate the different attitudes and views in the information technology debate. Transformists believe in the major transformation of everyday life due to the exposure of new information and new ways of dealing with that information. Continuists see the information revolution rather as an evolution from previous stages of communication systems, and are skeptical about the value of that apparent change. Finally structuralists believe that information technologies don't change the nature of the industrial society, and don't believe in a new social order emerging from it. Of importance in the debate is the rate at which institutions like schools, banks and public spheres change, and to what extent.

This reminds us of the old Piagetian paradigm: assimilation-accumulation. Papert states that the traditional school system doesn't change through accumulation but assimilation. Schools only accept what secures the persistence of the existing situation. Therefore - according to Papert - the first waves of technology did not change the organization of learning and teaching and was driven to its own bankruptcy, since computers were only adopted as add-ons to emphasize existing methods and organizations. OK, that was back in the 80s but do we have reasons to believe that the situation is different now? Can the new computers and network technologies reinforce the necessary innovations to educational systems?

From Wisdom to Creativity, Can I Have Another Piece of Teacher?

We believe that during the last decade the world has changed profoundly due to the proliferation of hybrid networks of computers and human beings, in an admixture not existing before (think where Castells would classify us!). Discourse in general has changed because the participants and the subjects have changed. Though there remains much more work to be made of real research into the use of multimedia and network media, instead of the bulk of justifications we often rely on. It is clear that current technologies are able to change the nature of information (the format) together with the cultural settings in which it is handled (the context and use).

The multitude of communication means allow us to think, express ourselves, and gather information in quite different ways than before: e-mail, listservs, news groups, chatting, video conferencing, the different www-implementations via javascript, java and cgi's...

In a couple of years' time the idea of the Net, the 'Web or any other cozy name you give to it, has changed because of the activities that are deployed on it. Kids do it, elderly people do it, professionals and unemployed do it, morons get spammed. Obviously, design is perceived through the innumerable graphics, movies, and animations that form an indispensable part of the experience of getting through data, downloading programs, and submitting a request for more information. But the real value of the 'design' is present in the simplicity of the format of the html-page, and the triviality of uploading that to a remote server. Anyone can do it; free tutorials and tools are abundant on the medium itself; and what is more, they are widely used!

To be honest, most people, including teachers and students of any age or gender, learn it quickly without taking traditional classes. They don't cling to the idea that you need a certificate to work with it, contrary to most other technological activities like driving cars or installing air conditioning. To our own astonishment two2 years ago, we could guide a bunch of language teachers through online resources and then stimulate them to make their own homepages, in only three evening sessions! They had never had any previous experience on the web but in the end some even had frames and animated gifs in their pages. Whether afterwards they could put it into further use or not, is beside the point here of course. Well, it takes more effort to become a good instructional designer, but on the other hand, we could argue that with such a transparent medium, some simple tools, and good common sense one could get far. And has not the teacher with or without technology always been some sort of designer without proper training, rather developing his/her experience in the field? So if we would be able to give a necessary introduction in technology, and get the message of innovation and change across ... but, many have said this before and I guess that would be too easy for teacher trainers...

Within the school environment, the difficult factor has always been access to equipment, for teachers and students alike. But recently, most of our governments and school managers have made a great effort in getting computers there, a tendency that is unlikely to stop (long live commodification?). What we grew more concerned with at the same time, however, was the ineffective use of information technology in the classroom and the fact that it proved difficult to integrate within traditional curriculum settings. Of course we are convinced that integration is very important, if only to comply with Seymour Papert's notions of successful implementation. But shouldn't we broaden our view in the light of what authentic activities on the net consist of, and allow the participants to change the classroom? There are various reasons why constructivism, open and distance education are badly understood and implemented in the field. In fact the whole of educational innovation with ICT has by many been perceived as a threat, where it should have been acquired as a benefit and convenience. But that is the exact point where we started this paper.

It seems hard to achieve innovation, because it requires more than good courses in new technologies, because what we really want is attitudes and proficiencies, even buildings and institutions, to change. That can only be brought about when the participants are immersed in authentic practices in which change seems evident, unconstrained, and intelligible. One way could be to enlarge our view of integration to the broader diversions in which students participate. Let us forget classroom borders, and design information, activities, and resources for a cultural setting in which school is no longer a singularity. Obviously we have to include the technological activities at home, at work, whatever they are, and relate them to the construction of expressions and models of knowledge that constitute learning. Now we see a lot of learning happening already out there on the web that is not always recognized by teachers, because they find it hard to assess. I think of the participation in list discussions and news groups, browsing, searching, saving local files for later use, playing games, making html-pages, animations, and the like.

I have seen more peer learning, coaching, and facilitating on the net only during the last year, than ever before in any classroom. Also, the subjects were not exclusively related to the medium itself, but included references to publications and resources outside the web. Thus, we cannot but take new ways of communicating seriously, because they modify our way of perceiving the world and alter our ways of thinking/learning. David Jay Bolter, in *Wired 5.01*, talks about the infamous Myst and Doom games as subverting the values of print because they supersede the book and, along with it, traditional verbal identity. The only ones who experience it as a threat are those whose values were formed in and by the age of print. He ends asserting that if the Supreme Court Justices would recognize this, they wouldn't worry about banning pornography, but they would ban "inexpensive digital cameras, graphic accelerator boards, 3-D rendering software, and, above all, the freedom to merge your point of view with that of a raindrop." And doesn't that last statement come very close to what we expect the learner to do?

Panic Design and Positive Breakdown

The educational digital designer from a constructivist point of view has to deal with the construction of knowledge and at the same time the construction of models to deal with that knowledge, as Jonassen pointed out long ago. But after a deep breath, and before he has jotted down his first tag, s/he already runs into huge problems. Due to the nature of the web, its users, and its applications, the participation of learner and teacher in a collaborative and culturally suited situation, is not a big issue. But what should be made of non-linear sequencing, the different media constraints, the status of the teacher, and designer or the quality assessment. By now, the teacher and most of the students are driven to despair as well. The more we try to get them involved in this uncertain learning/teaching situation with the use of ICT, the more we seem to push everyone and everything over the edge. So, maybe we have to turn to areas where the global wave of innovation and virtualisation progressed better, and learn from experiments that have succeeded. Even if they require a more radical point of view, we have to try to adopt them, instead of concentrating on the remediation of the growing mismatch of social and educational implementations.

Karamjit Gill, in the first chapter of his *Human Machine Symbiosis, The Foundations of Human-centered System Design*, extensively comments on methodological issues and combines dialogue, action research, and other collaborative techniques. Reminiscent of Terry Winograd and Paul Adler's *Usability, Turning Technologies into Tools*, traditional design is challenged. Drawing from the work of Polanyi *The tacit dimension*, the concept of "tacit knowledge" is elaborated in recent research. Also, some fundamental concepts for human-centered design like usability, breakdown, tool perspective, and language approaches are introduced. Especially the concept of breakdown is seen as a fundamental aspect of dialogue, reflection in practice, and mediation - all central concepts for educational design.

"While it is desirable to situate tools and systems within existing traditions and practice, breakdowns are also essential elements of innovation, creativity and designing for the future. This is the essence of participatory and cooperative design within the tradition of human-centeredness" (p 28)

Finally the concept of "user-involved" design, a set of cooperative and participation techniques, seems adequate to cope with current field problems in education, from the organizational, technological, and socio-cultural point of view. It can bridge a gap in a rather traditional and static environment, and realize part of the (social) constructivist agenda on a very immediate level, by involving the user directly in the development of interactive content (for learning). The designer is adopting a new role, but not by imposing solutions out of the blue - faintly hoping it will benefit users' skills. Designer becomes Mediator, using new strategies more appropriate to sustain the dynamic process of learning, in which novice gradually transforms into creative expert through dialogue with content and tools.

That sounds encouraging, doesn't it? But now back to the bench where the computer is waiting.

Open That Can of Software, Waiter

We try to implement these ideas in several cultural and educational projects, using different media and targeting different kinds of users. In each case we hope that the initial concepts, formulated as a task for us, can evolve

into the creation of a collaborative product, and can help the people involved to take on similar projects in the future. In 1991 we started with the development of a collection of contemporary references to several classical European literary works. We wanted to trace the corrections to the traditional canon, and reconstruct a debate through several representations in media and arts. The first outcome was an electronic book on disk on Cervantes' *Don Quixote*. The material was used for presentation of the research project and documentation on the subject. The second collection, on Defoe's *Robinson Crusoe* was done in 1992 and was transferred to www in 1993. The idea we had at that time, reflected a naive belief that very soon others would add to the collection and even, eventually take it over, to the benefit of education and culture. We contacted teachers from different disciplines to collaborate. Some came, some even proposed ideas, but most of them nodded and looked away. Most of them did not have the time, equipment, or desire to collaborate with an experiment. They also were very diffident about networks and after a while we moved to another project.

We were asked to document a governmental initiative about curriculum development and attainment goals for art education in Flanders. The idea was to "hyper-edit" the document with multimedia examples from classroom practice. The first change we proposed was the idea to mount it on a server instead of producing a CD-ROM. Secondly, we asked some organizations involved in art and children to try to document their projects for further linking. We hoped they would learn how to 'publish' on the web and maintain this service later on by themselves. Finally we went out to document good and useful practice in schools and other teacher education institutions. The idea with the external organizations did not really catch on though they were enthusiastic about it at first. We succeeded though in documenting some interesting projects ourselves and relating that to the cross-curricular spirit of the original text. We still think it is a nice environment, but additional funding would be needed to change it completely into a more collaborative environment supported by a larger school-based number of people. We still think the initiative came too early. There was not really an awareness of the possibilities of networks in our Flemish schools.

Then we got caught up in a series of projects resulting in a large conference for the whole of education in Flanders. While organizing the conference we developed a CD-ROM, documenting the involvement of teachers (primary and secondary education) into classroom practice with ICT. It became a timely document on disk showing attitudes and realizations about ICT, still without governmental involvement. It was interactively presented at the conference.

Currently three important projects are being carried out. The first project documents the development of a CD-ROM about multicultural childcare. It was conducted by the department of Psychology at the University of Ghent in collaboration with several partners from France, England, and Ireland. Each partner finally submitted a scenario for an interactive part, including all material (photos and video, graphics, sound) and a description of interactives. The CD-ROM was introduced at a conference in October 1997, and made a tour through Flanders on a so-called "technology bus". Recently the project team decided to switch to a non-involved method.

The second project describes our participation in the development of a "virtual center" on the web, for a European project called T3 (Telematics for Teacher Training). Our involvement started late in the project, and had to cope immediately with a very confused and complex situation. Due to circumstances, the so-called 'T3-centrum' was virtually non-existent, and separate www-environments had been developed by several partners. The first task was to coordinate a group of art students who were proposing a concept for the virtual centre in December 1997. Depending on that, a strategy for implementation, development and collaboration among the partners was introduced.

The third project is the creation of a www-course on cultural literacy at University of Ghent. The basic material has been selected, but since we believe that only through participation the environment can become binding, we are looking into a number of ways of involving students. The task is to go beyond the constraints of the traditional setting in which academic learning takes place, due to limitations of infrastructure, access, attitude, and assessment. We have already named the project secretly 'the conflict zone', and we hope it mixes down well with the imploding territories and blurring borders as they are explored and documented.

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